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also those which live in or upon its banks; and as the space here seems to be ample,— the ground covers about fourteen acres,— expense would be the only limit; so that, should the returns warrant, we may eventually include not a few subtropical or even tropical animals. The stream will be so turned as to run in winding channels through pond-like enlargements, much increasing the opportunity for the outdoor display of water-fowl and beast. Here will find their place fish-hatcheries where the processes of growth may be observed, and insectaries in which the changes which many creatures undergo in passing from an aquatic to an aerial life will be readily seen. So other significant transformations may be observed in displays which will show how readily certain brine shrimps may change their actual structure to become in a few generations fresh-water shrimps, and illustrate the rarely considered fact that all fresh-water organisms are modified descendants either of marine, or, by retrograde movement, of terrestrial, animals or plants. The broad relations of our three realms of life will thus be indicated. Here, too, will be fine opportunities for the growth of water-plants, both of the temperate zones and of the tropics; for, with proper care, even the wonderful *Victoria regia* can be grown in full beauty.

Many of these things will be seen, of course, under cover, where, in the inclement season, all creatures which live beneath the surface of the water must be housed. Houses must also be fitted for the protection as well as display of all foreign creatures, so that in winter and summer alike this section of the garden shall have its full share of attractions.

But the place of highest interest and usefulness is that which we wish first to undertake, the Marine Aquarium at City Point,— greatest, because of the larger variety of form, of structure, and of color among marine animals ; because, too, some of the most beautiful and most surprising of these creatures are inhabitants of our own seas, but are almost wholly unknown except to naturalists. When the display of the animals of our own waters in all their vivid coloring, lovely or grotesque form, and varied action, is ready, thousands will marvel at the revelation of a new world of their own of which they have not dreamed.

The ground here allotted, covering about eight acres, will be ready for occupation the coming summer, and will have as its chief attraction a building for aquaria, so arranged that almost the only light which enters the halls will be that which passes through the aquaria; and we may thus watch the creatures much as if we were ourselves beneath the sea, without those features which might make such a position disagreeable. The first room to visit, however, would be one devoted to an exposition of the relations of animals and plants to their surroundings, such as would give a clew to much we should afterwards see which would be otherwise obscure. Not only would the differences between the great groups of animals and plants be made clear by proper preparations and other exhibits, but a distinct effort would here be made to show what definite relations the structure of animals bears to their immediate surroundings and to their habits, and how animals are provided with the means to do the precise work they have to perform, for work is a condition of being. The changes that have taken place in the structure of certain descendants of air-breathing land animals, such as whales, in order to fit them for marine life, would be illustrated, and other fundamental laws of organic modification would be made clear by aids known to the expert. A similar introduction would be offered in the other sections of the gardens, modified to suit the immediate situation and multiply the illustration, so that the full value of each exhibit might be attainable on the spot.

In the general exhibition-rooms the individual aquaria are like the cases in a museum : their position or their contents may be altered or shifted at will to illustrate this or that feature. But it is probable that geographical data will always have a large influence on the juxtaposition and distribution of the inhabitants of the tanks, first, because it is possible and desirable to have many sorts — widely differing sorts of animals which do not come into collision — in a single vessel, but also because of the importance which relative depth in the ocean, as well as latitude and longitude, has upon marine life. Our own marine fauna and flora would be displayed by itself in special series of aquaria; while, as every desirable range of temperature would be possible in the different tanks by simply heating or chilling the inflow, or, by convection, the water in the vessel itself, tropical and arctic animals, once obtained, could be kept throughout the year.

Outside in the grounds large and small salt-water basins are planned, within which it is hoped to confine and exhibit some of our smaller cetaceans, porpoises, dolphins, etc., as also seals ; while upon their shores and islands water-fowl and other creatures would disport themselves. It may even be practicable by some device to create, in a basin of smaller extent, an artificial tide, with high water at noon and at midnight by the clock, so that the intertidal animals may find their place, the nimble "peep" scamper in flocks along the beach (their wings clipped, of course), while the margins shall represent at intervals a rocky and a sandy shore. This bit of marine life transplanted to our homes need not end here: we should reproduce also the vegetation of the immediate coast ; even the beach-grass of New England may find its corner and give its lesson, offering shelter and congenial home to the maritime locust, whose complete protection through its colorational resemblance to the sand it dwells upon would give to every one who sought it out a practical lesson in one of Nature's most hidden laws,— the importance of disguise and mimicry.

The finest existing zoölogical garden is controlled by a strictly scientific association, — the Zoölogical Society of London. It remains to be seen whether our Society of Natural History cannot accomplish in America a similar work. We may not be able to rival our transatlantic brethren in the extent of our menagerie,— here we are handicapped by the lack of colonial possessions,— but the wide extent of our country gives us altogether the advantage in a display of native animals ; and, if we rightly seize the opportunity before us, we may have a series of gardens second in educational value and in public interest to none in the world.

MEN WHO ARE WORKING WITH KOCH.

PROFESSOR KARL FRAENKEL, whose highly important experiments with a view to conferring immunity against diphtheria are now one of the chief topics of discussion in the medical world, is a pupil of Robert Koch. According to the *Lancet*, he passed his final examination as a physician in 1885, was appointed assistant in the Hygienic Institute, Berlin, on its establishment, and soon became Koch's first assistant there. In 1887 he established himself as private lecturer in Berlin University. About a year ago he was appointed professor of hygiene at Königsberg. He became generally known in medical circles by the publication of his "Elements of Bacteriology," in 1886. This book has appeared in a third edition, and has the reputation of being the best of its kind. The most important of Fraenkel's special in-

vestigations are those of bacterial poisons, which he made in common with Ludwig Brieger. They led to the discovery of toxalbumin, and to that above mentioned. His other discoveries are those concerning the bacterial contents of ice, the cultivation of bacteria which thrive without air, the occurrence of micro-organisms in the various layers of the soil, etc.

Dr. Kitasato, a Japanese by birth, has lived in Germany for five years, and has occupied himself almost all the time with bacteriological studies in the Hygienic Institute. The biology of the cholera bacillus has been the theme of many of his researches. He has investigated its behavior in milk and in fæces, and its relations to other pathogenic and non-pathogenic bacteria in nutritive solutions. He has also gone deeply into the study of the tetanus germs, and has now published the results of his investigations in his article on immunity. One of his chief discoveries is that of the musk fungus.

Dr. Ernst Behring, who has shown, in conjunction with Dr. Kitasato, how immunity against diphtheria and tetanus is conferred on animals, is an army surgeon, and has been working as an assistant for about a year and a half past in the Hygienic Institute. Among his first studies after he became a surgeon, ten years ago, was the manner in which antiseptic remedies for wounds, especially iodoform, act, and he made a special study of the symptoms of iodoform poisoning. He afterward tested the antiseptic value of silver solutions, creoline, and other chemicals. Cadaverine, the etiology of anthrax, and the immunity of rats, are also among the themes to which he has devoted special attention, but diphtheria has recently been his exclusive study.

HEALTH MATTERS.

Action of Living Blood on Bacteria.

PROFESSOR BONOME has recorded the results of his researches on the following points: whether physiological alterations in the blood play any part in modifying its destructive action on bacteria; whether it is possible to produce alterations in the composition of the blood of such a nature that the normal inimical action against bacteria may be altered; and whether it is possible to derive any reliable data that will throw light on the subject of immunity. As a result of his experiments, he comes to the conclusion that staphylococci introduced directly into the blood are destroyed in from ten to twenty-five minutes, more rapidly in the blood of young rabbits than in older animals of the same species (*British Medical Journal*). He then, by injecting the poison obtained from the pus of an old empyema or a chronic abscess in small quantities into healthy rabbits, proved that the bacteria-destroying activity of the blood is increased, the organisms used being staphylococcus aureus, albus, and citreus. He holds, however, that the introduction of such poison does not appear to exert any influence upon the similar activity of the fixed tissues. Poison from acute pus obtained in a similar manner appears to exert not the slightest influence on the destructive action of the blood; while, owing to its effect upon the tissue-elements, it diminishes their power of destroying such organisms as the staphylococci above mentioned. Similar poison from pyogenic staphylococcus culture does not increase this destructive power of the blood against the above-mentioned organisms; and any immunity that is produced depends, not on the rapidity and certainty with which the blood destroys the organisms introduced into its stream, but rather upon a greater resistance which the tissue-elements exert against the bacteria poison, when they have become accustomed to the action of the poison by remaining in contact with the metabolic products of the same bacteria. He also gives experiments to show that water injected into the veins can diminish this destructive activity of the blood to a certain extent, but never completely; for although the animals so injected, and control animals, died about the same time, those in which water had been injected usually showed small purulent deposits in the kidneys and myocardium, and more or less fatty degeneration of the epithelium of the kidneys: so that he considers, that, in addition to this slight diminution in the destructive activity of the blood, there is some alteration of the protoplasm of the cells, probably due to the absence of salts and the cutting-off of the full oxygen supply by the presence of water, by which their resistance is considerably diminished in certain areas, and owing to which they are more readily attacked by the injected staphylococci.

Amount of Sugar in Blood in Disease.

Dr. N. P. Trinkler recently read, before the Kharkoff Medical Society, a paper on the "Diagnostic Significance of the Quantity of Sugar and Reducing Substances in the Blood," in which he detailed a number of observations he had carried out on patients in Professor Grube's surgical clinic, the majority of whom were suffering from cancer (*The Lancet*). The blood of some, as described in the *Medical Record* of Jan. 3, was taken for examination during an operation, that of the rest being only obtained after death. The examination was in all cases made by means of two processes, — that of Fehling and Soxhlet, and that of Knapp (Knapp's solution consists of cyanide of mercury dissolved in caustic alkali),— the mean of the two results being taken. He found that the blood during life always contains less sugar than after death, and that that of persons suffering from cancer contains a larger proportion of sugar and reducing substances than that of healthy persons, or of persons suffering from other diseases. Affections of internal organs appeared to be accompanied by a greater percentage of sugar in the blood than diseases of the skin or of external parts. The degree of emaciation produced by cancer did not seem to have any direct effect upon the quantity of sugar in the blood. There did not seem to be any real correspondence between the amounts of sugar and other reducing substances: the sugar was much more constant in its amount, the quantity of the other reducing substances being liable to very considerable variations. In the observations made on various diseased conditions, the following were the amounts of sugar found: cancer, 0.1678 per cent to 0.2037 per cent; typhoid-fever, 0.0950 per cent; pneumonia, 0.0943 per cent; dysentery, 0.0838 per cent; organic diseases of the heart, 0.0737 per cent; peritonitis, 0.701 per cent; phthisis, 0.0653 per cent; syphilis, 0.0553 per cent; nephritis, 0.0489 per cent; hæmaturia, 0.0375 per cent.

A Surgical Use for Ants

Ants have very powerful jaws, considering the size of their bodies, and therefore their method of fighting is by biting. They will bite one another, and hold on with a wonderful grip of the jaws, even after their legs have been bitten off by other ants. Sometimes six or eight ants will be clinging with a death-grip to one another, making a peculiar spectacle, some with a leg gone, and some with half the body gone. One singular fact is, as we learn from the *Medical Record*, that the grip of an ant's jaw is retained even after the body has been bitten off and nothing but the head remains. This knowledge is possessed by a certain tribe of Indians in Brazil, who put the ants to a very peculiar use. When an Indian gets a gash cut in his hand, instead of having his hand sewed together, as physicians do in this country, he procures five or six large black ants, and, holding their heads near the gash, they bring their jaws together in biting the flesh, and thus pull the two sides of the gash together. Then the Indian pinches off the bodies of the ants, and leaves their heads clinging to the gash, which is held together until the gash is perfectly healed.

The Cradle of Influenza.

Professor Tessier, of the medical faculty of Lyons, has returned from Russia, whither he was sent last March to take evidence upon the course of influenza there, and the various conditions of its evolution. He found, according to the *Medical Record*, that influenza is a growth of Russian soil, and, when not a raging malady, is a smouldering one. The way the people live in winter, locked up in heated houses; the flatness of the soil, its consequent bad drainage, and universally sodden condition when the April thaw begins; the filthiness of the farm-yards, the village streets, and the rivers, which become suddenly swollen, and on falling leave a putrid mud behind,— all conduce to make influenza endemic. Its microbe is, in fact, to be found in this mud. Dr. Tessier calls it a strepto bacillus. What is peculiar in this dis-